Influence of visual feedback on the illusion of movement induced by tendon vibration of wrist in healthy subjects

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INFLUENCE DE FEEDBACKS VISUELS SUR L'AUGMENTATION DE L'ILLUSION DE MOUVEMENT INDUITE PAR LA VIBRATION TENDINEUSE DU POIGNET CHEZ DES SUJETS SAINS

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Introduction: Illusion of movement induced by tendon vibration is a powerful approach to improve cortical excitability and can be useful for rehabilitation of neurological impairments. The aim of our study was to investigate whether a visual feedback of a moving hand congruent to the proprioceptive illusion induced by a tendon vibration of the wrist could increase the illusion of movement.

Methods: We included 26 healthy controls in a Virtual Reality (VR) experimental protocol. Tendon vibration inducing illusion of movement (wrist extension) (100Hz) was applied on their non-dominant wrist during 3 VR visual conditions (10 times each in a randomized order): a moving virtual hand corresponding to the movement that the subjects could feel during the tendon vibration (Moving condition), a static virtual hand (Static condition), or no virtual hand at all (Hidden condition). After each trial, the subjects had to quantify the intensity of the illusory movement on a Likert scale, the subjective degree of extension of their wrist. At the end, subjects filled a post-hoc questionnaire.

Results: There was a significant difference between the 3 visual feedback conditions concerning the degree of wrist's extension and the Likert scale ranking ($p<0.001$). The Moving condition induced higher intensity of illusion of movement and higher sensation of wrist's extension than the Hidden condition ($p<0.01$ and $p<0.001$ respectively) and than the Static condition ($p<0.001$ and $p<0.001$ respectively). The Hidden condition induced higher intensity of illusion of movement than the Static condition ($p<0.05$) but there was no difference concerning the sensation of wrist extension between these two conditions ($p=0.80$). The subjects' preferred condition to facilitate movement's illusion was the Moving condition (66%).

Conclusions: This study demonstrated the importance of selecting carefully a visual feedback to improve the illusion of movement induced by tendon vibration, and the potentiation of illusion by visual cues congruent to the illusion of movement. Further steps will be to test the same hypothesis with stroke patients and to use these results to develop EEG-based Neurofeedback including vibratory feedback to improve upper limb motor function after a stroke.

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